

CLAIMS

1. A tire manufacturing method having a process for, in manufacturing product tires in plural sizes chosen from a group of sizes specified in advance, moving a tire being molded sequentially between 5 stations of a molding system having a plurality of working stations, sequentially assembling tire component members specified in advance corresponding to each working station and molding a green tire at a predetermined tact time, and a process for vulcanizing the molded green tire, to be performed at one or more working stations of said molding 10 system:

molding a green tire based on the molding sequence specified in advance, including combination of green tires in different sizes in tandem chosen as necessary from said group of sizes,

15 disposing a carcass band and both bead cores on a toroidal molding drum whose diameter can be expanded/reduced in the toroidal shape and locking the bead cores, expanding the diameter of the molding drum, toroidally extending the carcass band between both bead cores, rolling up the side portion of the carcass band around the bead cores outward in the radial direction, assembling tire component members with the bead cores 20 locked to the toroidal molding drum and molding the green tire, reducing the diameter of the molding drum, unlocking the bead cores, and removing the green tire from the molding drum.

2. A tire manufacturing method according to claim 1, wherein, in forming said carcass band, this member is assembled onto a cylindrical 25 molding drum to form a carcass band at working stations corresponding to an inner liner member and a carcass member, respectively, and then, the carcass band is removed from the cylindrical molding drum,

30 in molding said green tire, after said process for rolling up the side portion of the carcass member on the toroidal molding drum, a belt member, a tread member and a sidewall member are assembled at the respective corresponding working stations.

3. A tire manufacturing method according to claim 1 or 2, wherein at least one tire component member to be assembled at said working station

is comprised of one type of member element specified in advance and common to said group of sizes, and a green tire is molded by assembling the member element by an amount specified in advance for each tire component member for all the sizes in said group.

5 4. A tire manufacturing method according to claim 3, wherein at least one of said tire component members has a rubber ribbon made of a predetermined material continuously extruded through a die with a predetermined sectional shape as said member element, this rubber ribbon is wound on a cylindrical or a toroidal molding drum in the spiral shape
10 and this is laminated in the predetermined sectional shape, and this tire component member is assembled.

15 5. A tire manufacturing method according to claim 3 or 4, wherein at least one of said tire component members has a continuous sheet with a predetermined width made of a predetermined material as said member element, this continuous sheet is cut into the length specified in advance per size, narrow pieces in the number predetermined for each size are joined to each other so that the cut-off faces of the cut-off narrow pieces are aligned in the circumferential direction on the molding drum, and this tire component member is assembled.

20 6. A tire manufacturing method according to claim 3, wherein a tread member and a sidewall member are included in tire component members having the rubber ribbon in claim 4 as said member element, and an inner liner member, a carcass member and a belt member are included in tire component members having the continuous sheet with a predetermined width in claim 5 as said member element.

25 7. A tire manufacturing method according to any one of claims 3 to 6, wherein, as for at least one tire component member, said member element is directly assembled onto a cylindrical or a toroidal molding drum.

30 8. A tire manufacturing method according to any one of claims 3 to 6, wherein, as for at least one tire component member, said member element for a single tire is combined and then, the combined member element is assembled on a cylindrical or a toroidal molding drum.

9. A tire manufacturing method according to any one of claims 1 to 8, wherein among idle time at each of the working stations corresponding to each tact determined based on said molding sequence specified in advance, a tact time is changed for the respective tact so that the shortest 5 idle time becomes shorter.

10. A tire manufacturing method according to any one of claims 1 to 9, wherein an estimate equation is prepared in advance to estimate a primary harmonic component of radial run-out in a green tire caused by a relative displacement or angular displacement between the center of axis of 10 the carcass band and the center of axis of the bead core in setting the bead core on the outer circumference of the carcass band,

radial run-out of the green tire is measured for one cycle and an inverted waveform in which the primary harmonic component is inverted is obtained,

15 in molding a tire of the same size in said molding system thereafter, a relative displacement or an angular displacement between the center of axis of the carcass member and the center of axis of the bead core causing this inverted waveform is obtained by back calculation of said estimate equation, and the position or the angle of at least either one of the bead 20 core axis centers is changed by the magnitude of the displacement acquired from this estimate equation in the direction of the displacement acquired from this estimate equation so as to set the bead core on the carcass band.

11. A tire manufacturing method according to any one of claims 1 to 10, wherein vulcanization of the molded green tires is started sequentially 25 at said predetermined tact time and vulcanization of these tires is finished at said predetermined tact time.

12. A tire manufacturing method according to any one of claims 1 to 11, wherein inspection of the vulcanized tire is started at said predetermined tact time.